BELL, ALEXANDER GRAHAM (*b.* Edinburgh, Scotland, 3 March 1847; *d.* Baddeck, Nova Scotia, 2 August 1922), *technology.*

Both Bell's grandfather, Alexander, and his father, Alexander Melville, were teachers of elocution; his father was well known as the inventor of Visible Speech (a written code indicating the position and action of throat, tongue, and lips in forming sounds). Bell had a lifelong interest in teaching the deaf to speak, an interest intensified because his mother and his wife were deaf. In 1870, after the second of Bell's two brothers died of tuberculosis, the family moved to Canada. Bell did his early telephone work in Boston and subsequently moved to Washington. He became a citizen of the United States in 1882.

Bell achieved fame as inventor of the telephone and fortune under a broad interpretation given to the patent granted him 10 March 1876. His early experimental work was spurred on by a persistent belief in its ultimate commercial value, an enthusiasm unshared by his predecessor Philip Reis and his contemporary Elisha Gray. Although the telephone is not properly called a scientific invention (Bell's knowledge of electricity at the time was extremely limited), a fair proportion of the wealth he received from it was used by Bell to pursue scientific researches of his own and to support those of others.

His interest in the deaf led Bell to publish several articles on hereditary deafness. This in turn led to studies on longevity and a long-term series of experiments in which he attempted to develop a breed of sheep with more than the usual two nipples. In 1909, after twenty years of selection, he had a flock consisting solely of six-nippled sheep. He found, as he had suspected, that twin production increased with the number of nipples. Bell made a number of suggestions on the medical use of electricity but performed few experiments himself. His approach to these areas was as an amateur, although one with an active, inquiring mind.

Bell's financial support of science took several

forms. In 1880 he used the 50,000 francs of the Volta Prize to establish the Volta Laboratory Association (later the Volta Bureau), largely devoted to work for the deaf, in Washington. In 1882 he conceived the idea of the journal *Science*, which began publication in 1883. In the first eight years of its existence, Bell and his father-in-law, G. G. Hubbard, subsidized this journal to the amount of about $100,000. To allay S. P. Langley's concern that his post as secretary of the Smithsonian Institution would be merely administrative, Bell and J. H. Kidder each gave $5,000 for Langley's personal research; this money was used in the establishment of the Smithsonian's astrophysical observatory. In 1891 Bell gave $5,000 to support Langley's flight experiments. He himself experimented with kites, and in 1907 he organized the Aerial Experimental Association, which lasted for a year and a half and was financed by his wife. Bell also helped to organize and finance the National Geographic Society, serving as its president from 1898 to 1903.

Bell was elected to membership in the National Academy of Sciences in 1883 and was appointed a regent of the Smithsonian Institution in 1898.

BIBLIOGRAPHY

I. Original Works. A complete list of Bell's publications is given in Osborne's article (see below). His notebooks, letters, and other documentary material are nicely housed by the Bell family at the National Geographic Society; some of these have been reproduced on microfilm and are available at the Library of Congress and the Bell Telephone Company of Canada, Montreal. Bell's court testimony dealing with the telephone appears in *The Bell Telephone* (Boston, 1908). Most of the surviving pieces of apparatus are preserved at the Smithsonian Institution.

II. Secondary Literature. No satisfactory biography of Bell exists. Basic details can be found in W. C. Langdon's article on Bell, in *Dictionary of American Biography*, II, 148–152; C. D. Mackenzie, *Alexander Graham Bell, the Man Who Contracted Space* (New York, 1928); and H. S. Osborne, "Alexander Graham Bell," in *National Academy of Sciences, Biographical Memoirs*, **23** (1945), 1–30. Part of the experimental telephone work is analyzed in B. S. Finn, "Alexander Graham Bell's Experiments With the Variable-Resistance Transmitter," in *Smithsonian Journal of History*, **1**, no. 4 (1966), 1–16.

Bernard S. Finn